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(71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON
[SE/SE]; S-126 25 Stockholm (SE).
(72) Inventor: HEDBERG, Anders; Kännärsvägen 7G:206, S-226
46 Lund (SE).
(74) Agents: STRÖM, Tore et al.; Ström & Gulliksson AB, P.O.
Box 4188, S-203 13 Malmö (SE).

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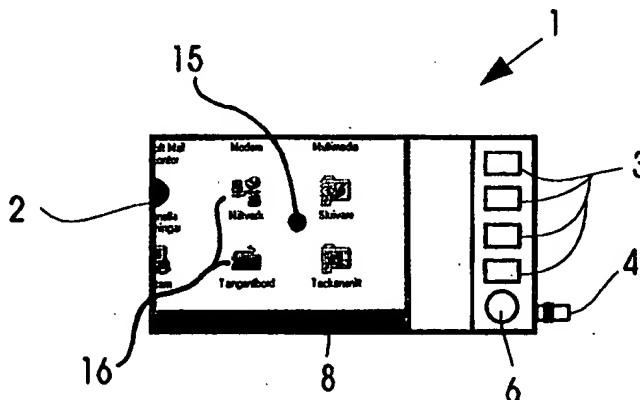
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Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: A HAND-HELD DISPLAY DEVICE AND A METHOD OF DISPLAYING SCREEN IMAGES

(57) Abstract

In a hand-held display device (1) for use with an electronic device (13) to display a complete or a determined part (8) of a screen image (7), there are included control circuits, a display screen (2) and control buttons (3) connected to said control circuits. Further, a gyroscope (6) is incorporated in said display device (1) and connected to said control circuits, whereby said display device (1) is responsive to movements in the space for displaying said screen image (7) in different magnifications, and/or in different parts (8). A fixed pointer (15) is arranged on the display screen (2) for controlling applications (16) shown on the display screen (2).



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TITLE:**A HAND-HELD DISPLAY DEVICE AND A
METHOD OF DISPLAYING SCREEN
IMAGES**

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Field of the Invention

10 The present invention relates to a hand-held display device, including a pointer, and a method for its use with an electronic device to display a complete or a determined part of a screen image.

Description of the Prior Art

15 Several electronic devices, such as a mobile telephone, a PDA (Personal Digital Assistant), an organizer, or a PC (personal computer) etc. are provided with a display or a monitor for displaying different kind of information. A typical personal computer system, notebook, or hand-held
20 computer consists of a system unit, storage means, a display, keyboard and a mouse or other interactive input devices such as a digitizing tablet, joystick, lightpen etc. to control the computer.

The primary attributes of a display is the size of
25 the display screen; the resolution of the display; and whether the display is monochrome or in colour. The size of a display screen can vary from, for example, 5 to 25 inches in diagonal dimension. The quality of output or the resolution of a common display or monitor is for example 640x480,
30 800x600, or 1024x768 pixels.

There is a variety of displays available from different vendors. These displays are designed to accomplish particular functions. An engineer needs a large high-resolution monitor for CAD-applications and a smaller monochrome
35 monitor for the display of text and graphic information. A full-page colour monitor can be utilized for both landscape and portrait presentations. Also, hand-held data entry de-

vices or computers are provided with a small display. A common hand-held data entry device has a limited keyboard and some kind of storage capability for the data. Another hand-held data entry device combines a hand-held optical
5 wand with a keyboard. Stock clerks use such devices in stores to collect and enter reorder data.

For some purposes small flat-panels are required to save space. Flat-panels are used in conjunction with small size electronic devices such as notebooks, hand-held com-
10 puters, mobile telephones etc.

Many vendors offer or are just about to offer hand-held computers. These computers are provided with flat-panels having for example a 640x240 resolution touchscreen, or 480x240 resolution touchscreen. Such panels or display
15 screens cannot be too limited in size and resolution to be useful for their intended purpose, i.e. to present general software applications such as word processing, desktop publishing, spreadsheet, databases, internet applications etc. The limitations are set in view of the sight properties of
20 a human being.

Consequently, a problem associated with prior art computer configurations is that access is needed to several types of computers provided with different displays suitable for different kinds of applications. As described
25 above, a very small sized flat-panel of a hand-held data entry device, a mobile telephone, or a computer etc. is not at the same time capable of displaying full-screen documents in a proper and readable way.

JP-A-7 234 664 discloses a document image display,
30 which reads out the contents of a document using a scanner and the image of the document is stored in a page memory. An area of the document specified by an operator is read from the memory and then magnified. The magnified area, stored in a working memory, is then displayed on an opera-
35 tion display.

Another problem or disadvantage associated with small devices such as hand-held computers or mobile telephones etc. is the cumbersome way in which applications and data are selected on the display of the device. Of course, it is not suitable to use a mouse in combination with a handheld device. Consequently, hand-held devices are provided with cursor control devices such as a trackball or a touch pad, in combination with push buttons, or arrow keys. However, said cursor control devices have a lower size limit, i.e. they must be large enough to be handled by a human hand.

Summary of the Invention

An invention disclosed by a previous Swedish patent application No. 9703589-3 is directed to an improved display device for use with an electronic device, which overcomes one or more of the limitations and disadvantages of the related art.

It is an object of said invention to provide a hand-held display device for use with an electronic device, said display device being suitable for the purpose of a hand-held data entry device as well as for both landscape and portrait presentations of a full-page word processing document. Further, it can satisfy the needs of an engineer working with CAD-applications as well as for the display of text and graphic information. Also, hand-held computers can be provided with a display device of the present invention.

Consequently, another object of said invention is to provide a hand-held display device for use with a computer to display a complete or a determined part of a screen image in a proper size with regard to the current needs or requirements of a user.

Still another object of said invention is to provide a display device incorporated in an electronic device such as a mobile telephone, a PDA (Personal Digital Assistant), an organizer, a data terminal to display a complete or a

determined part of a screen image in a proper size with regard to the current needs or requirements of a user.

These objects are accomplished by a display device having movement sensitive means such as a micro gyroscope, strain gauge, piezo-electric, or equilibrium of force
5 accelerometer etc incorporated in said display device, thereby being responsive to movements in the space for displaying the complete screen image in different magnifications, or in different parts.

10 Further, a method of displaying a complete or a determined part of a screen image in a proper size with regard to the current needs or requirements of a user is also provide by said invention, wherein said display device is activated by pressing an activation control button of said
15 display device, and said display device is moved essentially in the plane of said display device, whereby different parts of a complete screen image are shown on said display screen, and/or said display device is moved essentially in a direction perpendicular to the plane of said
20 display device, whereby the magnification of said screen image is changing.

However, an object of the present invention is to provide said display device with an appropriate cursor control device, small enough to fit in on said display
25 device and large enough to be handled by a human hand in an efficient way. This is accomplished by a fixed pointer arranged on the display screen of the display device according to the invention disclosed by the Swedish patent application No. 9703589-3.

30

Brief Description of the Drawings

In order to explain the invention in more detail and the advantages and features of the invention a preferred embodiment will be described in detail below, reference be-
35 ing made to the accompanying drawings, in which

FIG 1 is a front view of a display device according to one embodiment of the present invention, showing a cutting of a complete screen image,

FIG 2 is a schematical view of the complete screen image including the cutting in FIG 1, on a conventional CRT-device with a superimposed virtual display device according to the present invention,

FIG 3 is a view of a computer configuration provided with the display device according to the invention, operated by a user,

FIG 4 is a front view of the display device of FIG 1, showing the complete screen image of FIG 2 in a compressed shape,

FIG 5 is a front view of a mobile telephone provided with a display device according to the invention, and

FIG 6 is a front view of the display device in FIG 1 provided with a fixed pointer according to the invention.

Detailed Description of the Invention

A display device 1 according to the present invention for use with an electronic device such as a mobile telephone, a PDA (Personal Digital Assistant), an organizer, a data terminal or a computer to display a complete or a determined part of a screen image is shown in FIG 1. Said display device is provided with control circuits, not shown in FIG 1. A display screen 2 and control buttons 3, such as touch control buttons, are incorporated in said display device 1 and connected to said control circuits. For connection with a computer or a network connection means 4, for example an IR (infra red) or radio transmitter/receiver, or a connection cable etc. is attached to the display device.

Movement sensitive means 6 comprising a micro gyroscope, strain gauge, piezo-electric, or equilibrium of force accelerometer etc is incorporated in said display device 1 and connected to said control circuits, said display

device being responsive to movements in the space for displaying the complete screen image in different magnifications, and/or different parts of a screen image.

Power supply for the display device is provided by
5 for example local batteries, sunlight power, kinetic energy, or the power supply of an attached computer.

One of said control buttons 3 is an activation control button provided for activation of said display device 1 to be responsive for movements. Thus, said display device
10 1 is activated by pressing said activation control button 3, and then by moving said display device 1 essentially in the plane of said display device, different parts of a screen image are shown on the display screen 2.

This is schematically illustrated in FIG 2, wherein a
15 cutting 8, corresponding to the image shown on the display screen 2 in FIG 1, is surrounded by a superimposed dashed virtual display device 9 corresponding to the size of the display device 1. When said virtual display device 9 is moved around on said screen image 7, different cuttings 8
20 are covered. Correspondingly, these cuttings 8 are displayed when the real display device 1 is moved in the plane of said display device.

As shown in FIG 3, a user 10 is moving said display device up and down, illustrated by an arrow 11, and to the
25 left and right, illustrated by an arrow 12, to present different parts of the screen image 7. In a particular position in the space the cutting 8 of the screen image 7 is presented on the display screen 2. Hence, it is possible for the user of the display device 1 to read text that does
30 not actually fit into the small display screen 2, by moving the display device a short distance in space in the plane of said display device.

By activation of said display device 1 by pressing said activation control button 3 and then moving said display device back and forth, essentially in a direction per-
35

pendicular to the plane of said display device, illustrated by an arrow 14, the magnification of said screen image 7 is changed or the image is zoomed. As shown in FIG 3 and in more detail in FIG 4, it is possible to zoom out as much as
5 an overview of the complete screen image 7 is shown on the display device 1.

In an embodiment of the invention, shown in FIG 6, said display device is provided with an appropriate cursor control device, small enough to fit in on said display
10 device and large enough to be handled by a human hand in an efficient way. A fixed pointer 15 is arranged on the display screen 2 of the display device 1 according to the invention. Thus, said display device 1 is activated by pressing one of said activation control buttons 3 and by
15 then moving said display device back and forth, as illustrated by an arrow 14 in FIG 3, the magnification of said screen image 7 being changed or the image being zoomed. As shown in FIG 3 and in more detail in FIG 4, it is possible to zoom out as much that an overview of the complete screen
20 image 7 is shown on the display device 1. With reference to FIG 6, when a particular field of the screen image is shown on the display screen and, for example, a desired application represented by an icon 16 is located "under" the fixed pointer, the user activates or starts the application
25 by pressing one of the control buttons dedicated for this "cursor" control function. Further, the fixed pointer is used to select data, activate windows, or scroll windows and perform other similar functions usually done by means of a conventional mouse or track ball.

30 It should be apparent that the present invention provides an improved display device 1, including a pointer, and a method for use with an electronic device such as a computer 13 to display a complete or a determined part of a screen image 7 by moving said display device 1 in the
35 space, wherein different parts of the screen image 7 are

shown in different magnifications on said display screen 2, and for controlling applications 16 shown on the display screen 2 in a convenient and efficient way. Although the invention has been described in conjunction with a specific
5 embodiment thereof, this invention is susceptible of embodiments in different forms, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the specific embodiment
10 illustrated.

For example, in another embodiment of the invention the different parts: display screen, movement sensitive means, control buttons, electronic circuits and/or connection means, of said display device can be
15 incorporated as a single unit or as separate parts in an electronic device such as a mobile telephone, a PDA (Personal Digital Assistant), an organizer, data terminal, or a hand-held computer, wherein the operations described above are performed in a similar manner. Consequently, the
20 conventional keypad of the particular electronic device may comprise control buttons for the display functions of the invention. Further, these kinds of electronic devices, provided with a display device of the invention, can work as stand alone devices with no need for connection means,
25 as well as devices having a connection with another electronic device or network.

In a particular embodiment of the invention said display device is incorporated in a mobile telephone unit providing both computer and telephone facilities, shown in FIG
30 5. The conventional transmitter/receiver units of the mobile telephone may be utilized as connection means for connection with other electronic devices or networks.

Different kinds of technologies can be utilized for the display screen 2, such as LCD (liquid crystal display),

gas plasma, EL (electroluminescent), TFT (thin film transistor) etc.

CLAIMS

1. A hand-held display device (1) for use with an electronic device (13) to display a complete or a determined part of a screen image (7), provided with control
5 circuits, a display screen (2) and control buttons (3) connected to said control circuits, movement sensitive means (6) incorporated in said display device (1) and connected to said control circuits, whereby said display device (1) is responsive to movements in the space for
10 displaying said screen image (7) in different magnifications, and/or in different parts (8),
c h a r a c t e r i z e d by a fixed pointer (15) arranged on the display screen (2) for controlling applications (16) shown on the display screen (2).

15

2. A display device according to claim 1,
c h a r a c t e r i z e d by a fixed pointer (15) arranged on the display screen (2) for controlling applications, selecting data, activating windows, or scrolling
20 information in said windows.

3. A display device according to claim 1 or 2,
c h a r a c t e r i z e d by movement sensitive means (6) comprising a micro gyroscope, strain gauge, piezo-electric,
25 or equilibrium of force accelerometer.

4. A display device according to any of the preceding claims, c h a r a c t e r i z e d by connection means (4) for connection with an electronic device (13) or a network.

30

5. A display device according to claim 4,
c h a r a c t e r i z e d in that said connection means (4) is a light or radio transmitter/receiver, or a connection cable.

6. A display device according to any of the preceding claims, characterized by being incorporated in a mobile telephone, a PDA (Personal Digital Assistant), an organizer, data terminal, or a hand-held computer.

5

7. A display device according to any of the preceding claims, characterized by an activation control button (3) provided for activation of said display device (1) to be responsive for movements.

10

8. A display device according to any of the preceding claims, characterized in that said display screen (2) is an LCD-display, a gas plasma display, an EL (electroluminescent) display, or a TFT (thin film transistor) display.

15

9. A method of displaying a complete or a determined part (8) of a screen image (7) provided by a an electronic device (13) connected to a hand-held display device (1)

20

according to any of the preceding claims,
characterized by the steps of

activating said display device (1);

moving said display device (1) essentially in the plane (11,12) of said display device (1), whereby different parts (8) of a complete screen image (7) are shown on said display screen (2); and/or

25

moving said display device (1) essentially in a direction (14) perpendicular to the plane of said display device (1), whereby the magnification of said screen image

30

(7) is changing (FIG 3).

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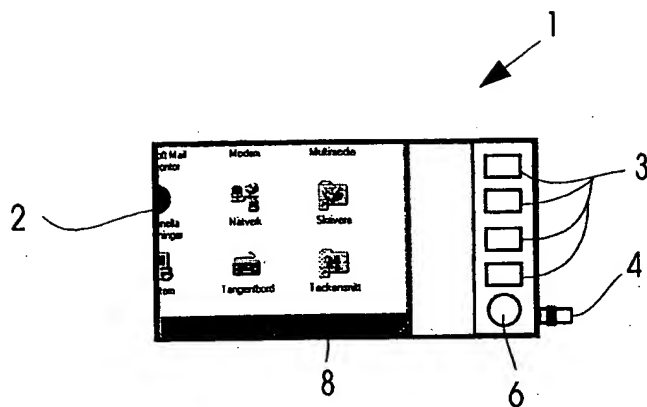


FIG. 1

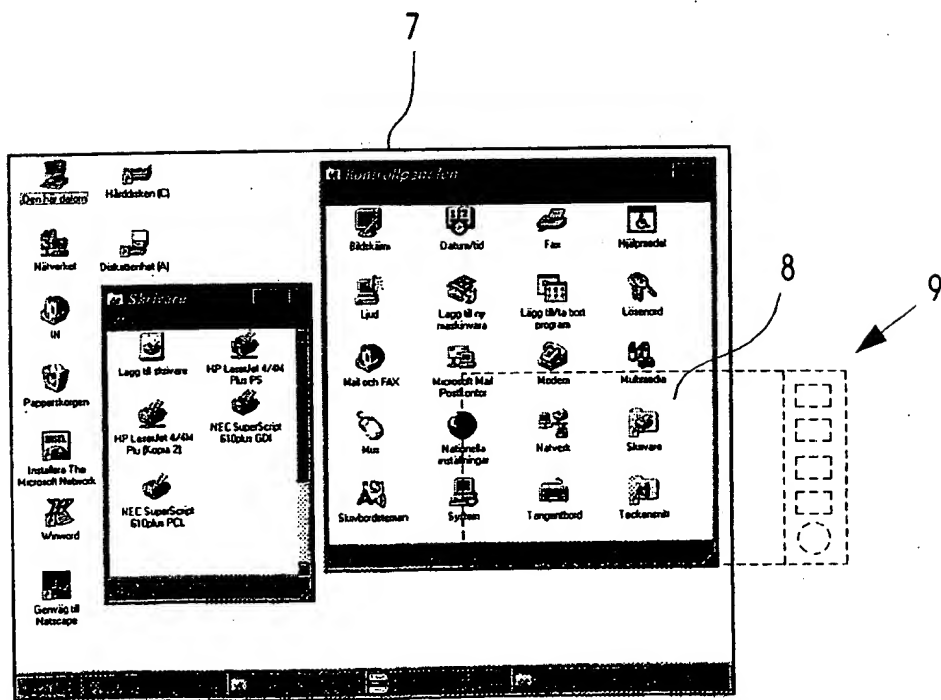


FIG. 2

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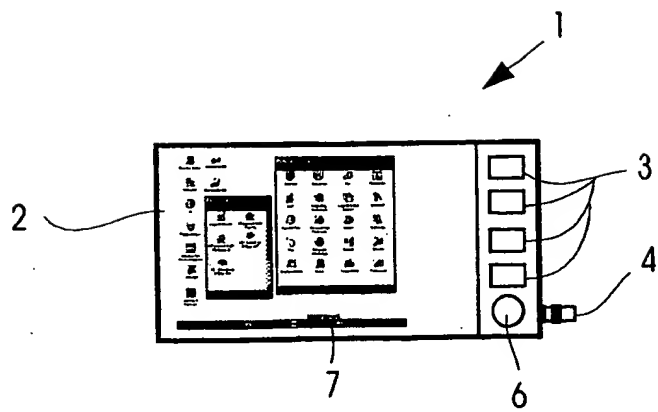
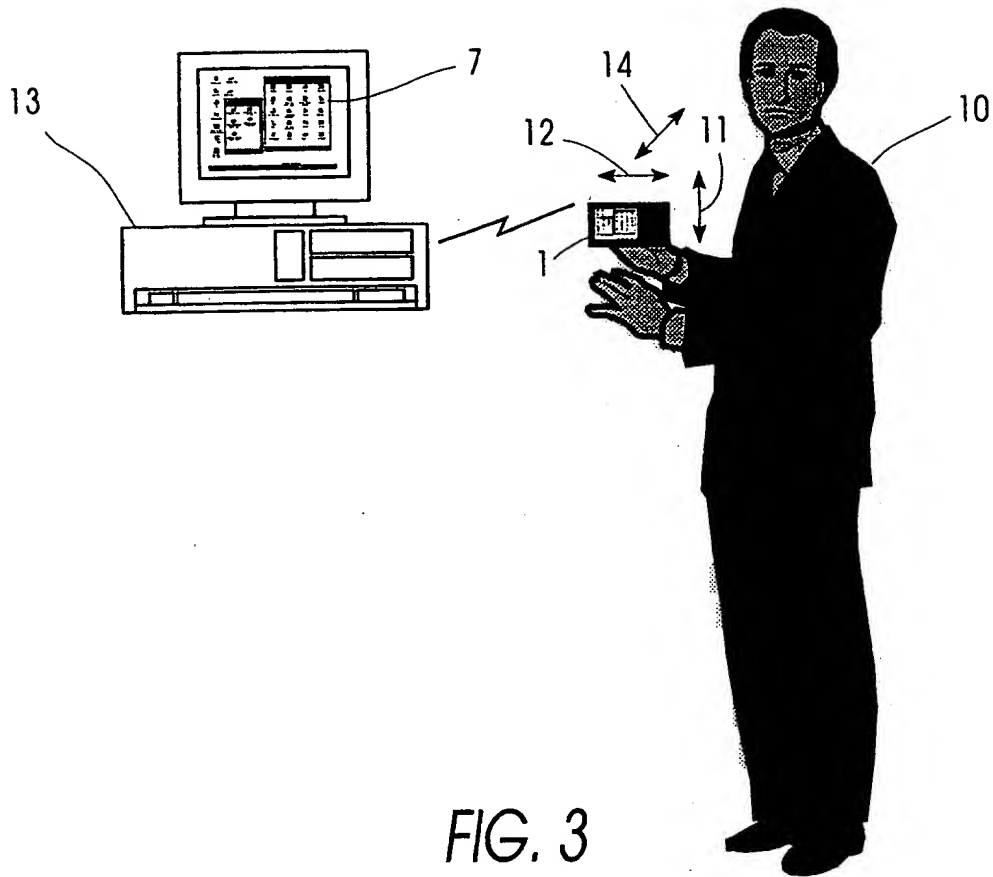


FIG. 4

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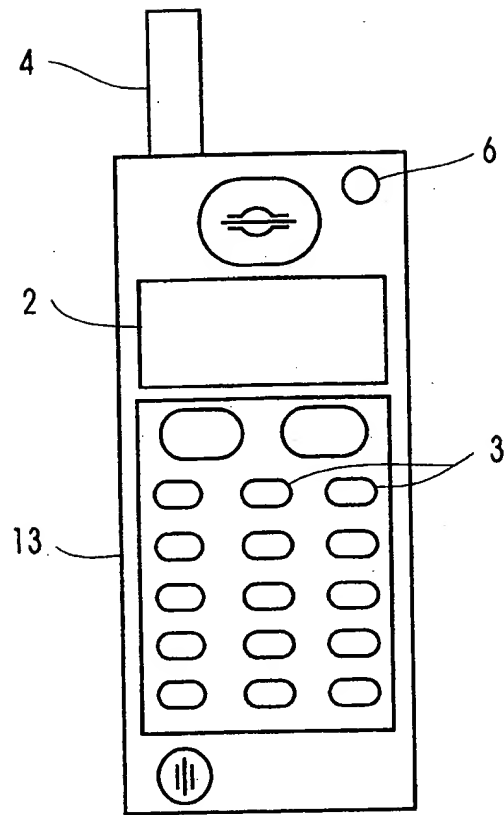


FIG. 5

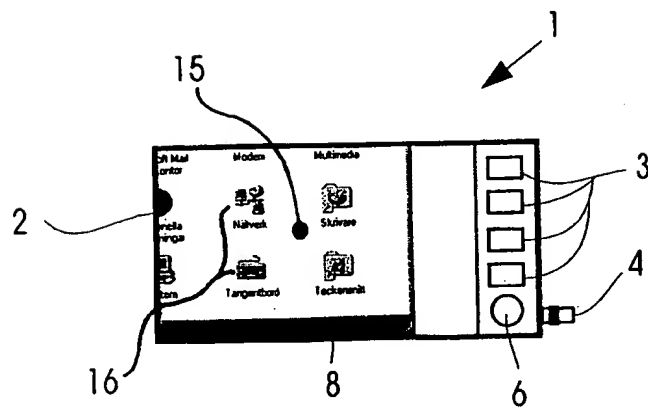


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/02414

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G06F 3/147, G06F 3/03

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	US 4734689 A (SHIGEO KURAKAKE), 29 March 1988 (29.03.88), abstract --	1-9
A	US 5526481 A (TERRY J. PARKS ET AL), 11 June 1996 (11.06.96), column 2, line 20 - column 3, line 3 --	1-9
A	US 5655094 A (TROY LEE CLINE ET AL), 5 August 1997 (05.08.97), column 1, line 60 - column 2, line 8 -- -----	1-9

☐

Further documents are listed in the continuation of Box C.

☒

See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

03/05/99

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PCT/SE 98/02414

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4734689 A	29/03/88	DE 3606858 A,C JP 2021627 C JP 61204686 A JP 2678270 B JP 61250681 A	11/09/86 26/02/96 10/09/86 17/11/97 07/11/86
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